INTEGRAND

INTEGRAND

January 1981 Catalog

S100 Microcomputer Products

About Main/Frames

A MAIN/FRAME has several basic functions:

1. Enclose the computer
2. Supply power to boards (and/or drives)
3. Connect the computers cards together via the motherboard
4. Cool the computer

If a package fails to do one or more of the above it is inadaquate. We will examine these functions and provide some insight into why our equipment is built like it is.

ENCLOSURE The enclosure is more than just another pretty face. In spite of first impressions, aesthetics are not everything when enclosures are concerned. Consider the Volkswagen Bug. It looks like something only a mother could love, but works like "60". The box must be sturdy enough to withstand the rigors of use in the intended environment. Sufficient support must be supplied for the internal parts which are mounted in it (drives and such) to make the entire assembly moveable or shippable. The enclosure should provide attenuation for the RF sources inside to eliminate interference with adjacent electronic equipment. AC distribution must be provided to run the power supplies, fans, drives and other ac powered units.

A customer once commented upon receipt of his Integrand MAIN/FRAME that the thing seemed to be built to withstand small nuclear explosions. He was probably exaggerating a tad, but other customers have reported dropping a system down a flight of stairs or being involved in a traffic accident where the equipment went from the rear door of a station wagon to the front seat with little effect on the MAIN/FRAMES or their contents. We don't recommend these as test procedures. Integrand cabinets are built from heavy gauge aluminum (.125 inch in some instances). Heavy brackets are included on some models to retain disk drives. All metal construction aids in radiated RF attenuation.

A complete card cage with snap-in plastic guides for all locations is standard. The cage has adjustable positioning for board width and relative position to the motherboard.

EMI filters on the power line inputs limit conducted RF interference from the enclosure and protect circuits inside from line transients caused by fluorescent lights, motors and other noise sources. AC power distribution within the cabinet is designed to limit the possibility of accidentally touching a "hot" ac circuit.

POWER SUPPLY Were there such a thing as electronic psychology the power supply would probably be nominated "THE MOST FRUSTRATED ELECTRONIC DEVICE". It is assigned whatever space is left over in the cabinet after all other components are installed. AND expected to perform properly in that spot even if that is not a good power supply location. A real Cinderella story. You see, a power supply has no carisma. It is not exotic, nobody wants to waste their time on a gadget so obvious as a power supply. BUT, power supplies are NOT obvious or trivial. The supply is as important as any component in the system. A well designed power supply WILL make the difference between a computer that works and one which doesn't.

IR has many years of experience in supplies. We have had the opportunity to learn what works and what doesn't--and our supplies WORK. We have been at it long enough to not treat supplies as a trivial sideline. We design and build them ourselves. We call our equipment BOAT/ANCHOR supplies for good reason. They are designed very conservatively. We use components which are adaquate (usually MORE than adaquate) for the job; no skimping on capacitors, transformers, etc. Filter caps and transformers are EXPENSIVE! Skimping on parts is a nice way to reduce the price of a supply if you don't care how long the thing will work or whether it performs some of its nonobvious functions at all.

The power supply must provide properly conditioned voltages to run the computer cards (and disk drives), suppress incoming power line transients, and provide holdover for some types of power line dropouts. The supply must exhibit good long term stability and reliability. These things just do not happen; they need careful design and manufacturing.

Heat is the enemy of any piece of electronic equipment. The less the

temperature rise, the more likely the supply (or anything else for that matter) will have a long happy life. A power supply that runs hotter than Uncle Oscars chili is asking for reliability problems. Integrand power transformers are BIG. They exhibit low temperature rises. They are expensive, but they are necessary to provide proper operation over the long haul.

All Integrand power supplies have fuses in DC outputs, current limiting on regulated voltages, bleed resistors to discharge filter capacitors when the power is off, connectors on AC and DC , multitap primaries for use on various line voltages or adjustment for different DC loads.

It is easy to SAY your supply does 30 amps; the real question is DOES IT? And if it does it FOR HOW LONG before it vaporizes in a cloud of flaming insulation and squirting electrolyte. Some supplies for S100 equipment are 30 amps (or 15 or whatever) in name only. Saying doesn't make it so. Quality parts and design make it so. How do you know if a supply will work at the specified curents? Compare it to ours-transformer size, capacitor and diode ratings heat sink sizes, general component quality (from recognized firms). If it's not a Boat/Anchor it might be a squirrel!

If you are selling computers you want them to go out the door once and stay out. We build our supplies to fulfill that requirement.

MOTHERBOARD Motherboards of differing card capacity are incorporated into the various Integrand MAIN/FRAMES. All boards use .75" spacing between connectors, .250" between pin rows and .125" between pins in the same row. Boards are designed to meet the IEEE 696 requirements.

Our motherboards use the Quasi/Coax technique; that is each signal line has a ground line running on each side and a ground line under it on the opposite side of the board. This technique reduces self and mutual inductance of the signal lines to control bus ringing. The boards have large ground return traces and heavy copper etch (2 oz) for without this the interlaced grounds are reduced in effectiveness.

Many systems do not require the use of termination and in some systems terminators are detrimental. As a result we supply motherboards without terminators. If your system requires the use of termination, it may be added at the time you order as a factory installed option or later as an easily installed kit. When installed, active termination is provided at BOTH ends of the board.

The connectors used on our motherboards are of the highest quality, gold plated, bifurcated, bellows contact type. This type of connector is considerably more expensive than many we see in other S100 equipment. BUT contact forces to the board is superior, plating does not flake from the contacts and they give good service over the life of the equipment. We do not use cantilever contact connectors which we consider substandard.

COOLING We belabored the cooling point in the power supply section, but it is true. The truism holds for all electronic assemblies. Assemblies with IC's are even more sensitive to increased temperatures than power supply components. For some strange reason people think if you punch a hole in the enclosure and put a fan in it you are doing a good cooling job. NOT SO!

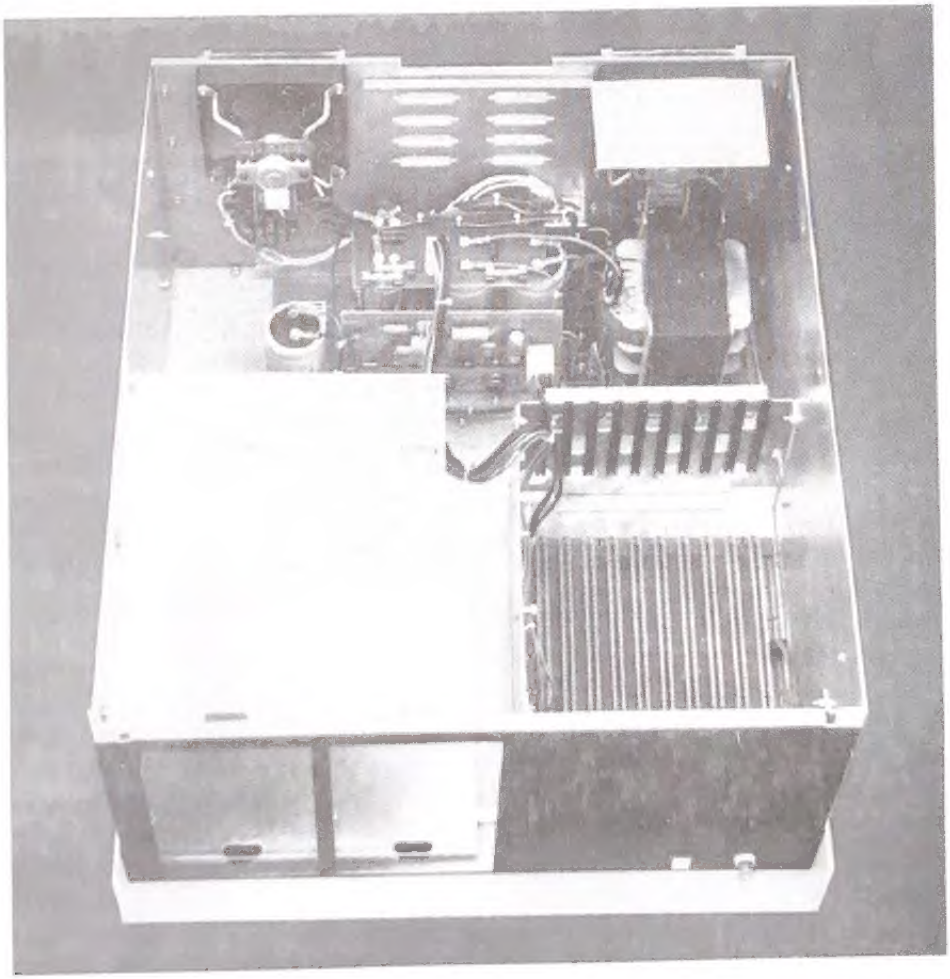
Consider this analogy. The enclosure is a big bucket of water, the heat to be removed is a colored dye dropped into the water. How do you get the dye out of the water? Stirring the buckets contents doesn't remove the dye; just as having an improperly placed fan doesn't remove heat. The way to remove the dye is to run fresh water into the bucket (and the dyed water OUT of the bucket). The more (LARGER VOLUME) fresh water goes into the bucket the faster the dye will be purged. And so it is with heat. To remove it from the enclosure you need air flow THROUGH the enclosure. Stirring doesn't help. Even stirring up a hurricane doesn't help! Cooling is accomplished by heating the air which passes THROUGH the enclosure. For a given power dissipation within the cabinet it follows that the smaller volume of air flowing through the box the higher the temperature rise in the confined area. Conversely the larger volume of air moving through the lower the temperature rise.

Integrand uses straight through low impedance flow paths for cooling our enclosures. The minimum amount of resistance to flow is accomplished by the use of large, cleverly disguised cooling slots in the cabinet walls (1"

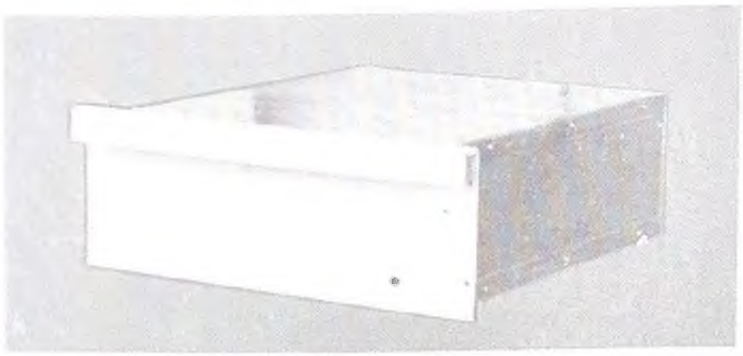
x 16" is typical). This allows the minimum static pressure inside the box resulting in greater fan efficiencies. The internal component layout of a MAIN/FRAME is arranged to maximize the effect of the forced air flow. Several models use deflecting vanes to aim moving air at critical areas while others use more than one fan to acccomplish the required cooling. The fans used in most IR equipment are the super reliable open frame type. Their design is very simple and little can or does go wrong. Another plus for this fan type is their operation is very quiet.

MAIN/FRAMES and DISK/COVERS which support disk drives use POSITIVE pressure within the cabinet. In other words, air is drawn into the cabinet by the fans; creating a positive pressure with respect to room pressure. Optional washable fan dust filters are available to filter incoming air. Removal of dust is important for the reliable operation of drives. The positive pressure of filtered air keeps the drives bathed in clean air. If a negative internal pressure is used, dirty air is pulled into the box through the drives causing premature failures.

We hope reading this article has given you an insight to the design philosophy of Integrand equipment. We have made it quite detailed to answer as many questions as possible. We hope the information will help you analyze the relative merits of the various mainframes on the market.



800DB2F-8E-10CI-FILTER



800

Rackmount Main/Frames

Standard and 5 inch Floppy

800 — **$230**

RACKMOUNT MAIN/FRAME--15 S100 CARDS--STANDARD POWER SUPPLY
7" rack increment. Cabinet size:17"w x 19"d x 6.7h. Front panel painted dove grey; remainder of surfaces yellow irridite. 15 position IEEE compatible motherboard (will accept T801 terminator kit see OPTIONS), card cage with all guides. Reset switch on front panel. Power switch, 8 DB25 cutouts and 2 BNC mounting holes on rear panel. 70CFM fan, EMI filter, 6' power cord, line fuse, clamped flat cable exit. P800 power supply (+8@15A,+16@3A,-16@3A). MOTHERBOARD CONNECTORS OPTIONAL, see OPTIONS.

800A — **$315**

RACKMOUNT MAIN/FRAME--15 S100 CARDS--HEAVY DUTY POWER SUPPLY
Same as 800 except 110CFM fan and P800A power supply: (+8@30A, +16@10A, -16@10A).

800B — **$250**

TALL RACKMOUNT MAIN/FRAME-15 S100 CARDS--STANDARD POWER SUPPLY
Same as 800 except 8.75" x 19" rack increment. Cabinet size:17"w x 19"d x 8.3h. See OPTIONS for motherboard connectors, paint and other options.

800F — **$250**

5 INCH FLOPPY RACKMOUNT MAIN/FRAME-15 CARDS-STANDARD POWER SUPPLY
Same as 800 except has mounting for 1 SHUGART SA 400 5" disk drive. Drive support brackets supplied. Flat rack panel front. See OPTIONS for drive power regulator and cables.

800AF — **$335**

5 INCH FLOPPY RACKMOUNT MAIN/FRAME-15 CARDS-HEAVY POWER SUPPLY
Same as 800F except 110CFM fan and P800A power supply. See OPTIONS for drive power regulator and cables.

8002F — **$270**

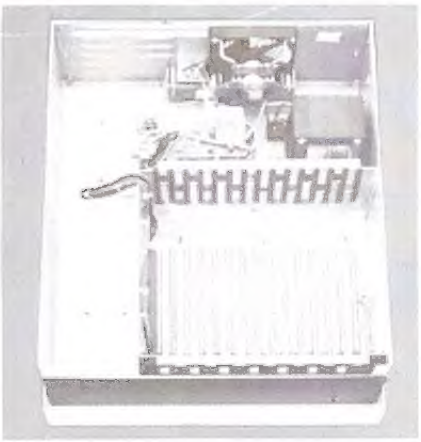
5 INCH FLOPPY RACKMOUNT MAIN/FRAME-10 CARDS-STANDARD POWER SUPPLY
Same as 800 except mounting for 2 SHUGART SA 400 5" disk drives. Drive brackets supplied. Flat front panel. 10 position motherboard. See OPTIONS for drive power regulators and cables.

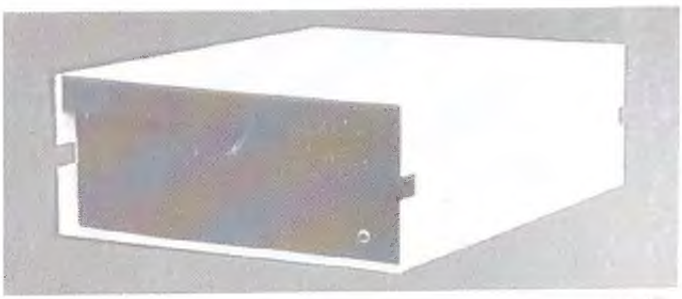
800A2F — **$355**

5 INCH FLOPPY RACKMOUNT MAIN/FRAME-10 CARDS-HEAVY POWER SUPPLY
Same as 8002F except 110CFM fan and P800A power supply. See OPTIONS for drive power regulators and cables.

<MOTHERBOARD CONNECTORS ARE OPTIONS ON ALL MODELS ON THIS PAGE>
<See OPTIONS for pricing and installation information>

<Also see OPTIONS for available paint color schemes, 220V operation, more or fewer DB25 cutouts, terminators, etc. >





800D

Desktop Main/Frames

Standard and 5 inch Floppy

X5 — $200

DESKTOP MAINFRAME--5 CARDS--SMALL POWER SUPPLY
Cabinet size: 9.4"w x 16"d x 7.5h. Cabinet painted dove grey, front panel is black. NO OPTIONAL COLORS! 5 position motherboard, 5 connectors installed, card cage with all guides. Reset switch on front panel. Power switch, 4 DB25 cutouts, 1 BNC mounting hole, 70CFM fan, EMI filter, 6' power cord, line fuse, and clamped flat cable exit on rear panel. PX/5 power supply (+8@10A, +16@1.5A, -16@1.5A). Power supply is a removable module.

800D — $255

DESKTOP MAIN/FRAME--15 CARDS--STANDARD POWER SUPPLY
Cabinet size:17"w x 20.5"d x 7.5h. Cabinet painted dove grey, front panel is black (for other color schemes see OPTIONS). 15 position IEEE compatable motherboard (will accept T801 terminator kit, see OPTIONS), card cage with all guides. Reset switch on front panel. Power switch, 8 DB25 cutouts, 2 BNC mounting holes, 70CFM fan, EMI filter, 6' power cord, line fuse, and clamped flat cable exit on rear panel. P800 power supply (+8@15A,+16@3A,-16@3A). Power supply is a removable module. MOTHERBOARD CONNECTORS OPTIONAL, SEE OPTIONS.

800AD — $340

DESKTOP MAIN/FRAME--15 CARDS--HEAVY DUTY POWER SUPPLY
Same as 800D except 110CFM fan & P800A pwr supply +8@30A, +16@10A, -16@10A

800DF — $270

5 INCH FLOPPY DESKTOP MAIN/FRAME-15 CARDS-STANDARD POWER SUPPLY
Same as 800D except has provision for mounting 1 SHUGART SA 400 5" DISK DRIVE. Drive support brackets supplied. Drive not supplied. See OPTIONS for drive power supply regulator and connecting cables.

800ADF — $355

5 INCH FLOPPY DESKTOP MAIN/FRAME-15 CARDS-HEAVY POWER SUPPLY
Same as 800DF except 110CFM fan P800A power supply. See OPTIONS for drive power regulator and cables.

800D2F — $280

5 INCH FLOPPY DESKTOP MAIN/FRAME--10 CARDS--STANDARD POWER SUPPLY
Same as 800D except has provision for mounting 2 SHUGART SA 400 5" DISK DRIVE. Mounting brackets supplied for drive. Drive not supplied. 10 position motherboard. See OPTIONS for drive pwr supply regulator and connecting cables.

800AD2F — $365

5 INCH FLOPPY DESKTOP MAIN/FRAME-10 CARDS-HEAVY POWER SUPPLY
Same as 800D2F except 110CFM fan and P800A power supply. See OPTIONS for drive power regulator and cables.

<MOTHERBOARD CONNECTORS ARE OPTIONS ON ALL MODELS ON THIS PAGE except X/5. See OPTIONS for pricing and installation information>
<Also see OPTIONS for available paint color schemes, 220V operation,extra or fewer DB 25 cutouts, terminators, etc.>

700

700

Disk/Covers

2 or 3 Eight inch Floppies

700 — $225

RACKMOUNT HORIZONTAL DISK/COVER--2 EIGHT INCH DRIVES--DRIVES HORIZONTAL 7" x 19" rack increment. Cabinet size: 17.5"w x 20.5"d x 5.7"h. Front panel painted black; remainder of external surfaces are yellow irridite. Mounting for 2 EIGHT INCH SHUGART SA801R FLOPPY DISK DRIVES (or mechanical equivalent *). Drive mounting brackets supplied. Drives not supplied. 70CFM fan, 6' three wire line cord, power switch, line fuse, EMI filter and clamped flat cable exit on rear panel. P794 power supply: +5@4A, +24@5A--6A peak, -5@.75A. All voltages regulated. Power supply is a removable module.

700RV — $265

RACKMOUNT VERTICAL DISK/COVER--2 OR 3 EIGHT INCH DRIVES--DRIVES VERTICAL 10.5" x 19" rack increment. Cabinet size: 17"w x 21.5"d x 9.6"h. Front panel painted black; remainder of external surfaces are yellow irridite. Mounting for 2 EIGHT INCH SHUGART SA801R FLOPPY DISK DRIVES (or mechanical equivalent *). 3 drives may also be specified when ordering at no extra cost. Other drives can be accomodated, contact factory for information. Drive mounting brackets supplied. Drives not supplied. 70CFM fan, 6' three wire line cord, power switch, line fuse, EMI filter and clamped flat cable exit on rear panel. P794 power supply: +5@4A, +24@5A--6A peak, -5@.75A. All voltages regulated. Power supply is a removable module.

700D — $250

HORIZONTAL DESKTOP DISK/COVER--2 EIGHT INCH DRIVES--DRIVES HORIZONTAL Cabinet size: 20"w x 23"d x 7.5"h. Cabinet painted dove grey, front panel is black. Mounting for 2 EIGHT INCH SHUGART SA801R FLOPPY DISK DRIVES (or mechanical equivalent *). Drive mounting brackets supplied. Drives not supplied. 70CFM fan, 6' three wire line cord, power switch, line fuse, EMI filter and clamped flat cable exit on rear panel. P794 power supply: +5@4A, +24@5A--6A peak, -5@.75A. All voltages regulated. Power supply is a removable module.

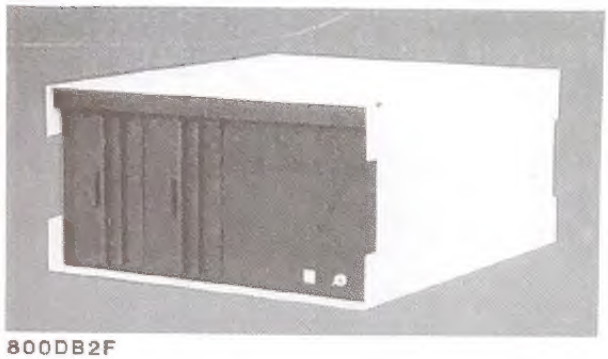
700DS — $250

VERTICAL DESKTOP DISK/COVER--2 EIGHT INCH DRIVES--DRIVES VERTICAL Cabinet size: 13.5"w x 23"d x 11"h. Cabinet painted dove grey, front panel is black. Mounting for 2 EIGHT INCH SHUGART SA801R FLOPPY DISK DRIVES (or mechanical equivalent *). Drive mounting brackets supplied. Drives not supplied. 70CFM fan, 6' three wire line cord, power switch, line fuse, EMI filter and clamped flat cable exit on rear panel. P794 power supply: +5@4A, +24@5A--6A peak, -5@.75A. All voltages regulated. Power supply is a removable module.

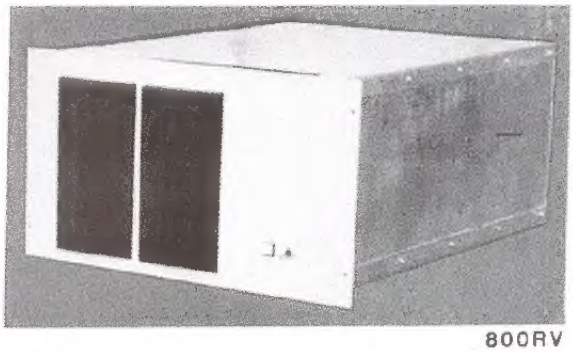
700DV — $275

VERTICAL DESKTOP DISK/COVER--2 OR 3 EIGHT INCH DRIVES--DRIVES VERTICAL Cabinet size: 20"w x 23"d x 11"h. Cabinet painted dove grey, front panel is black. Mounting for 2 OR 3 EIGHT INCH SHUGART SA801R FLOPPY DISK DRIVES (or mechanical equivalent *). SPECIFY 2 OR 3 DRIVES WHEN ORDERING. Drive mounting brackets supplied. Drives not supplied. 70CFM fan, 6' three wire line cord, power switch, line fuse, EMI filter and clamped flat cable exit on rear panel. P794 power supply: +5@4A, +24@5A--6A peak, -5@.75A. All voltages regulated. Power supply is a removable module.

<* Shugart SA801R, 851R, Remex 2000, 4000, Qume DT8, Siemens "D" chassis>



800DB2F



800RV

8 inch Floppy Main/Frames

8 inch Floppy and Winchester

800DB2F — $390

8 INCH FLOPPY DESKTOP MAIN/FRAME-10 CARDS-INTEGRATED DISK+S-100 PWR SUPPLY Cabinet size:20"w x 23"d x 11"h. Cabinet painted dove grey, front panel is black (for other color schemes see OPTIONS).•Provision for mounting two 8" FLOPPY DISK DRIVES (SHUGART SA 801R or mechanical equivalent *). Top and bottom drive support brackets supplied. Drives not furnished. Mounting for other drives is available at extra cost, contact factory. 10 position IEEE compatable motherboard (will accept T801 terminator kit, see OPTIONS), card cage with all guides. Lighted reset switch and key lock power switch on front panel. •Two switched ac outlets, •8 DB25 cutouts, •2 BNC mounting holes, two 70CFM fans, EMI filter, 6' three wire power cord, line fuse, and clamped flat cable exit on rear panel. Power supply generates unregulated voltages for motherboard and regulated voltages for drives. P894 power supply (+8@15A, +16@2A, -16@2A unregulated and +5@4A, +24@4A--6A peak, -5@.75A all regulated). Power supply is removable module. MOTHERBOARD CONNECTORS OPTIONAL, SEE OPTIONS.

800DW — $465

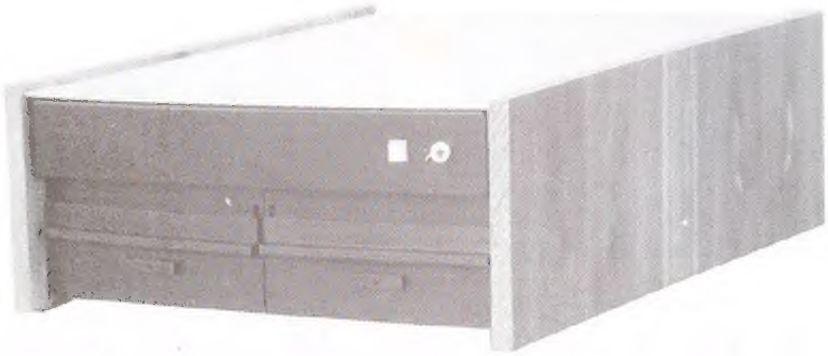
8" WINCHESTER/FLOPPY DESKTOP MAIN/FRAME-10 CARDS-HEAVY POWER SUPPLY Same as 800DB2F except will accept one SHUGART SA1000 8" WINCHESTER DISK DRIVE and one SHUGART SA801R 8" FLOPPY DISK DRIVE or their mechanical equivalents). Top and bottom drive brackets supplied. Drives not furnished. Power supply generates unregulated voltages for motherboard; regulated voltages for drives and controllers. P896 power supply (+8@15A, +16@2A, -16@2A unregulated and +5@10A, +24@7A--9A peak, -5@.75A all regulated). Power supply is removable module. MOTHERBOARD CONNECTORS OPTIONAL, SEE OPTIONS.

800RV — $365

8 INCH FLOPPY RACKMOUNT MAIN/FRAME-5 CARDS-INTEGRATED DISK+S-100 PWR SUPPLY 10.5" x 19" rack increment. Cabinet size:17"w x 21"d x 10"h. Front panel painted black, other surfaces yellow irridite (for other color schemes see OPTIONS). Provision for mounting two 8" FLOPPY DISK DRIVES (SHUGART SA 801R or mechanical equivalent *). Drive support brackets supplied. Drives not furnished. Mounting for other drives is available at extra cost, contact factory. 5 position S-100 motherboard including 5 connectors, card cage with all guides. Lighted reset switch and key lock power switch on front panel. Eight DB25 cutouts, 2 BNC mounting holes, 70CFM fan, EMI filter, 6' three wire power cord, line fuse, and clamped flat cable exit on rear panel. Power supply generates unregulated voltages for motherboard and regulated voltages for drives. P894 power supply: (+8@15A, +16@2A, -16@2A unregulated and +5@4A, +24@4A--6A peak, -5@.75A all regulated). Power supply is removable module.

<MOTHERBOARD CONNECTORS ARE OPTIONAL ON ALL MODELS ON THIS PAGE except 800RV. See OPTIONS for pricing and installation information>
<Also see OPTIONS for available paint color schemes, 220V operation, extra or fewer DB25 cutouts, terminators, etc.>
<* Shugart SA801R,851R, Remex 2000,4000, Qume DT8, Siemens "D" chassis>

INTEGRAND STOCKS SHUGART SA801R (single side) & SA851R (double side) FLOPPY DISK DRIVES FOR YOUR CONVENIENCE
SA801R=$450 SA851R=$595



8 inch Floppy Main/Frame

1100 $525

8" DESKTOP FLOPPY PHASE/80 MAIN/FRAME-7 S100 CARDS

Integrand's PHASE/80 series brings a new standard of appearance, performance and value to S100 mainframes. The 1000 DESK+MAIN/FRAME is the premiere model in this series. 1000 is a super appearance workstation-mainframe for business applications. In applications requiring a desktop unit, the 1100 is the ULTIMATE DESKTOP 8" FLOPPY MAIN/FRAME. As a member of the new PHASE/80 series the 1100 exhibits clean low profile styling which fits well into any office evironment. The 1100 has been packaged with an eye to small overall size while still allowing easy service access. But, it's not just another pretty face. The 1100 is as rugged as it is handsome with a .125 inch thick aluminum chassis and elegant three quarter inch thick woodgrain side panels. It's at home in the office, the lab, the production line or wherever your requirement is located.

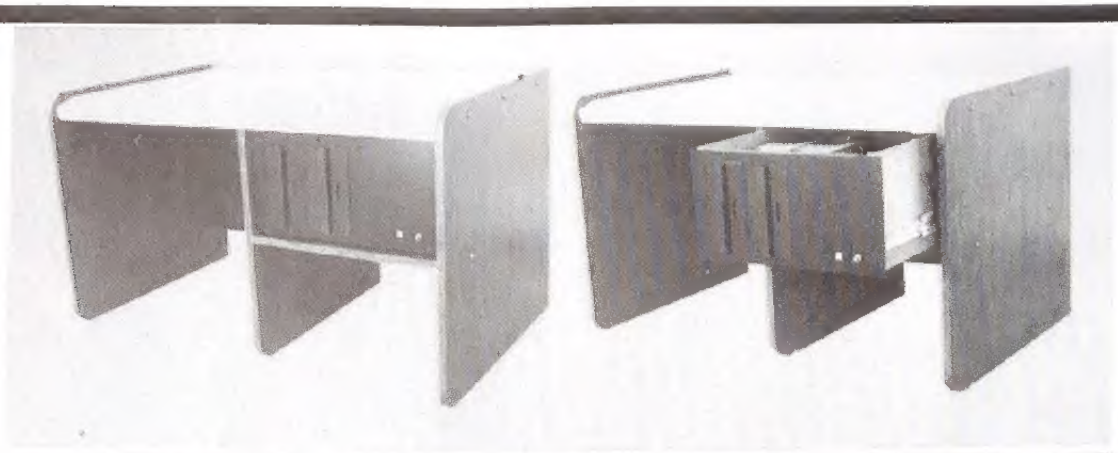
Inside, the 1100 is our most advanced MAIN/FRAME. The 1100 mounts 8" drives horizontally so cabinet height is no larger than a typical 5" drive mainframe. The chassis is pressurized with dust free air by a rear mounted fan and washable dust filter. The top and bottom of both drives are continually bathed by the forward moving air stream. No dead air spots here. The power supply is another Integrand BOAT/ANCHOR. The supply is of special design to fit into the air stream for maximum thermal coupling. The card cage uses our TORNADO cooling technique. A SEPARATE fan-plenum combination is mounted on the card cage providing uniform, high velocity air motion over all cards. IR's advanced design QC-7 QUASI/COAXIAL motherboard is standard; fully populated with super quality GOLD PLATED bellows contact edge connectors. The 7 position motherboard has plenty of room for modern systems, single or multi user.

Combine the 1100, two Shugart SA801R disk drives, an FDC1 CPU-I/O-Disk Controller board and a DM6400 Memory board. This makes a CP/M, double density, 64K, Z80 based computer for less than $3000 in quantity one! At this price the system has 1 megabyte of disk storage, two RS232 serial ports and one parallel port. The system takes up only 2 of the available 7 motherboard positions allowing 5 slots for future expansion. For more information on this system see the Application Note #3 "SON OF BUILDING CHEAP COMPUTERS" elsewhere in this catalog.

SPECIFICATIONS:

Cabinet size:19"w x 7.5"h x 23"d. Provision for mounting two Shugart SA801R (or mechanical equivalent*) eight inch floppy disk drives. Drives mount horizontally. Drive mounting brackets supplied. Drives NOT supplied. 7 position IEEE compatible motherboard WITH ALL CONNECTORS INSTALLED (will accept T801 terminator kit, see OPTIONS). Lighted reset switch and key lock power switch on front panel. Two switched ac outlets, 8 DB25 cutouts, 2 BNC mounting holes, two 70CFM fans one with washable dust filter, EMI filter, 6' three wire power cord and line fuse. Power supply generates unregulated voltages for motherboard and regulated voltages for drives; +8@10A, +16@2A, -16@2A unregulated and +5@3A, +24@3A-6A peak, -5@.2A all regulated. Power supply to disk drive cables furnished-SPECIFY SINGLE OR DOUBLE SIDED DRIVES WHEN ORDERING.

<* Shugart SA801R, SA851R, Remex 2000, 4000, Qume DT8, Siemens "D" chassis>



Desk+Main/Frames

Floppy and 8 inch Winchester

1000 **$900**

DESK+MAIN/FRAME--10 CARDS--STANDARD INTEGRATED DISK + S-100 POWER SUPPLY
The INTEGRAND MODEL 1000 DESK+MAIN/FRAME. There is nothing quite like it! A MAIN/FRAME that makes your system look like "a million bucks". A complete workstation for little more than the price of the other guys' desktop mainframe.

An 8" FLOPPY MAIN/FRAME cleverly disguised as a classy desk. The only indication that a MAIN/FRAME lurks within the svelt form of the desk are the disk drive bezels, power and reset switches blended into the drawer front. Nestled in the slide out electronics drawer is a full 10 position IEEE compatible S-100 card cage, space for two 8 inch floppy disk drives and an Integrand "Boat Anchor" power supply! The first mainframe designed as part of a desk-workstation, not an add on afterthought.

The desk is constructed of sturdy formica laminated wood. The sides and center vertical are attractively grained designer walnut. Top is finished in ivory. The desktop, equipment shelf and sides are interlocked into side panels by tongue and groove construction assuring maximum mechanical stability. The electronics drawer front is black textured paint. Access to PC cards, drives, and power supply is through top once drawer is pulled out.
SPECIFICATIONS:
Desk size:48"w x 30"d x 27.5h. Provision for mounting two Shugart SA801R (or mechanical equivalent*) eight inch floppy drives. Drives mount vertically. Top and bottom drive support brackets supplied. Drives NOT furnished. 10 position IEEE compatible motherboard WITH ALL CONNECTORS INSTALLED (will accept T801 terminator kit, see OPTIONS). Lighted reset switch and key lock power switch on front panel. Two switched ac outlets, 8 DB25 cutouts, 2 BNC mounting holes, two 70CFM fans with washable dust filters, EMI filter, 6' three wire power cord, line fuse, and clamped flat cable exit on rear panel. Power supply generates unregulated voltages for motherboard and regulated voltages for drives. P894 power supply (+8@15A,+16@2A,-16@2A unregulated and +5@4A,+24@4A--6A peak,-5@.75A all regulated). Power supply is removable module.

1005 **$600**

ELECTRONICS DRAWER ASSEMBLY FROM MODEL 1000
The electronics drawer MAIN/FRAME as used in the Model 1000. Same electrical specifications as Model 1000. Drawer includes slide assembly which must be bolted to a horizontal shelf. Requires front opening 21.25"w x 11.25"h and 28" depth.

1010 **$975**

DESK+MAIN/FRAME--10 CARDS--INTEGRATED WINCHESTER/FLOPPY+S-100 POWER SUPPLY
Same as Model 1000 except has P896 power supply. This supply will operate various floppy replacement WINCHESTER disk drives, their controllers, and S-100 cards. Supply electrical specs: +8@15A, +16@2A, -16@2A unregulated. +5@10A, +24@7A--9A peak, -5@.75A (or -12@.75A) all regulated.

1015 **$675**

ELECTRONICS DRAWER ASSEMBLY FROM MODEL 1010
The electronics drawer MAIN/FRAME as used in the Model 1010. Same electrical specifications as Model 1010. Drawer includes slide assembly which must be bolted to a horizontal shelf. Requires front opening 21.25"w x 11.25"h and 28" depth.
<* Shugart SA801R, 851R, Remex 2000, 4000, Qume DT8, Siemens "D" chassis>

Options

PR800 — $20

MINIFLOPPY DRIVE POWER REGULATOR CARD
PC card installs in space provided in 800F,800DF, 8002F,800D2F, 800AF, 800ADF, 800A2F, 800AD2F to provide +5@1A and +12V@1.4A for operation of 1 or 2 SHUGART SA400 or equivalent minifloppy disk drive.

MOTHERBOARDS

INTEGRAND QUASI/COAXIAL S100 MOTHERBOARDS
Interlaced ground motherboards. Ground track on either side and under each signal line. Accepts optional T801 terminator kit to terminate at both ends of board. Terminator does not take up a connector position. Double sided, FR-4 .062" material with 2oz traces. Heavy ground and power busses. Solder masked. Set up for IEEE 696 signal assignments. Includes DC power and reset connectors, mounting bars. Accepts connectors (optional) with TERMINATION OPTIONAL.

QC-7	7 Slot	Price $25.00
QC-10	10 Slot	Price $35.00
QC-15	15 Slot	Price $45.00

CONNECTORS — $6 installed

Super high quality S100 connectors. GOLD PLATED "bifurcated, bellows" contact design assures superior contact forces after many insertions. A bellows contact comes through the connector base then is bent around on itself to form a spring between the inside of the connector body and the PC card edge connector. A bifurcated contact is one which has the contacting area split into more than one section. Bifurcation allows essentially two contacts per pin instead of one assuring more stable connections. Many connectors sold in S100 based equipment use the cheaper "cantilever" contact design. While cantilever connectors are "adaquate" their long term reliability, in our opinion, is questionable. Naturally, quality costs us more and our connector prices are maybe not the all time lowest. BUT our customers experience few connector related problems. Instead of filling our motherboard with a full load of mediocre connectors we allow you to choose how many good connectors you need to support your system. In the long run you save money and get better connectors in the deal!!
CHOOSE AS MANY AS YOU WISH FOR THE SYSTEMS YOU ARE BUILDING. $5.00 EA IF YOU INSTALL AND TEST, $6.00 EA IF WE INSTALL AND TEST.

ACTIVE TERMINATOR — $40 installed,$25 kit

ACTIVE TERMINATOR--TERMINATES BOTH ENDS OF THE BOARD
Provides active termination to QUASI/COAXIAL motherboards at both ends. Uses SIP resistor packs instead of individual resistor used by others. Can be factory installed on your motherboard at time order is placed or easily installed by you if your systems needs termination. OLDER IR MOTHERBOARDS WHICH ARE NOT QUASI/COAX REQUIRE PLUG IN TERMINATORS--T801 WILL NOT WORK!

PAINT COLOR OPTIONS — $15

Standard colors on all MAIN/FRAMES and DISK/COVERS are DOVE GREY (very light grey) with BLACK PANELS. OPTIONAL COLOR SCHEMES:
IP---IVORY cabinet with BLACK panels (reminiscent of HAZELTINE terminals)
BP--- SAND cabinet with COCOA panels

FAN DUST FILTERS — $7ea

Washable dust filters to clean air coming into the cabinet. Highly recommended on systems using disk drives. Increases MTBF of drives substantially and reduses media contamination. AVAILABLE ONLY ON CABINETS WHICH SUPPORT DISK DRIVES, either 5" or 8". 800DB2F REQUIRES 2 FILTERS!

DRIVE CABLE ASSEMBLIES

CS84 — $18

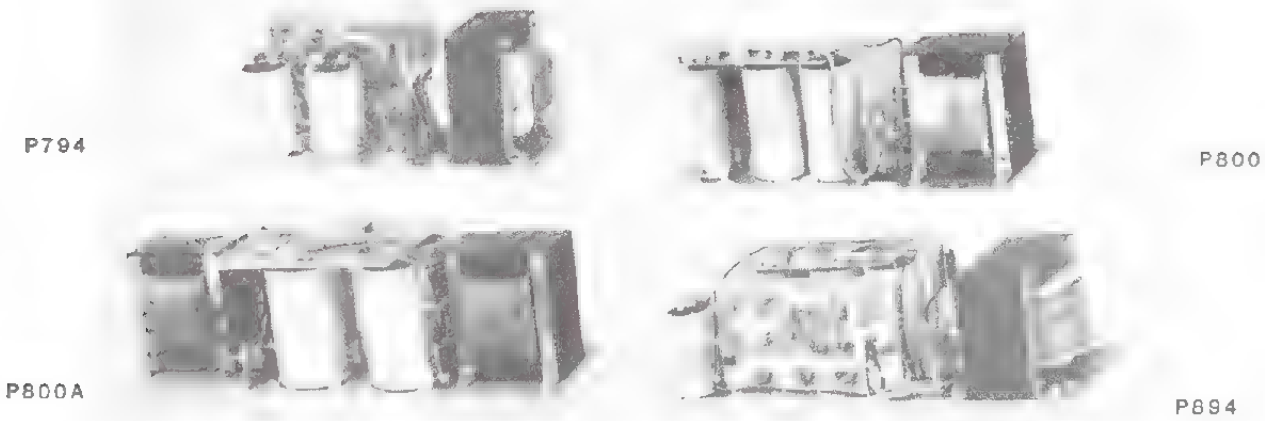
AC-DC CABLE SET--IR POWER SUPPLIES TO TWO SINGLE SIDED 8" DISK DRIVES
For SHUGART SA801R compatible drives and P794, P894 or P896 only.

CS85 — $18

AC-DC CABLE SET--IR POWER SUPPLIES TO TWO DOUBLE SIDED 8" DISK DRIVES
For SHUGART SA851R compatible drives and P794, P894 or P896 only.

CS5 — $15

DC CABLE SET--IR POWER SUPPLIES TO PR800 THEN TO TWO 5" DISK DRIVES
For SHUGART SA 400 compatible drives and P800 supply only.



Power Supplies

P800 — $99

STANDARD S100 POWER SUPPLY-- 8V@15A, +16@3A, -16@ 3A
Complete, mounted on its own chassis. Baseplate size: 5" x 13"; 5.2" hi. Big transformer with 3 primary taps, 130,000uf on 8V, 11,000 on each 16V. 25A bridges on both supplies. All DC voltages fused. AC input and DC output in connectors.

P800A — $195

HEAVY DUTY S100 POWER SUPPLY-- 8V@30A, +16@10A, -16@10A
Complete, mounted on its own chassis. Baseplate size: 5.5" x 16"; 5.2" hi. TWO big transformers (one for 8V & the other for 16V) each with 3 primary taps. 200,000uf on 8V, 41,000 on each 16V. 50 A rectifiers on 8V, 25A rectifiers on 16. All DC voltages fused. AC input and DC outputs terminated in connectors.

P894 — $200

S100 & 8" FLOPPY DRIVE POWER SUPPLY--REGULATED AND UNREGULATED OUTPUTS
8V@15A, +16@2A, -16@2A unregulated; +24@4A-6A peak,+5@4A,-5@.75A all regulated. Complete, mounted on its own chassis. Baseplate size: 5.5" x 16"; 5.2 hi. HUGE transformer with 3 primary taps. 130,000uf on 8v (+5) supply, 11000uf on each 16. All DC voltages fused. AC input and DC outputs terminated in connectors.

P896 — $300

S100, 8" FLOPPY DRIVE AND WINCHESTER DRIVE POWER SUPPLY
8V@15A, +16@2A, -16@2A unregulated; +24@8A-9A peak, +5@10A, -5 or -12@1A (jumper selectable) all regulated. Complete, mounted on its own chassis. Baseplate size: 5.5" x 16"; 5.2 hi. Mechanically interchangable with P894. HUGE transformer with 3 primary taps. All DC voltages fused. AC and DC outputs terminated in connectors.

P794 — $120

STANDARD 8" FLOPPY DISK POWER SUPPLY--+5V@4A,+24V@5A-7A PEAK, 5@.7A
Complete, mounted on its own chassis. Baseplate size: 4.5" x 11.5"; 5" hi Runs up to 4 drives like SHUGART SA801R. All outputs are regulated. AC input and DC outputs terminated in connectors.

P700A — $148

HEAVY DUTY 8" FLOPPY DRIVE POWER SUPPLY
+5@8A,+24@4A-6A peak,-5@.75A all regulated. +5 unregulated @ 4A. If unregulated voltage not used +5 regulated supply may be used to 7A. Complete, mounted on its own chassis. Baseplate size: 5" x 11.5"; 5" hi. Runs up to 2 drives like PERSCI 277 or 2 drives like SHUGART SA 801R and other electronics requiring +5 regulated. AC and DC terminated in connectors. This supply is optional on 700D, 700RV, 700DS cost is $75 additional. Supply alone is $148.

18 V Option — $15 additional

For P800,P800A, P894 and P896. 16V supplies are replaced by 18V.

220 V Option — $20 additional

For P800, P800A, P894, P896; transformer primaries tapped for 210, 230 and 260VAC. For P794, P700A; primaries set for 230VAC.

CABINETS

Most Integrand cabinets are available separately. All cabinets include line cord, line fuse, power switch, fan(s), EMI filter. MAIN/FRAME cabinets DO include reset switch, but DO NOT include card cage, motherboard and power supply. All cabinets which support disk drives include drive brackets. DISK/COVER cabinets DO NOT include power supply. Consult MAIN/FRAME or DISK/COVER descriptions for cabinet specifications.

C800	$125	C800D	$135	C800DB2F	$225	C700	$130
C800F	$130	C800DF	$140	C8008	$150	C700RV	$135
C8002F	$135	C800D2F	$145	C700D	$145	C700DS	$145
C800RV	$145	C700DV	$225	CX/5	$115		

ORDERING & SHIPPING INFORMATION

UNIFORM SHIPPING, INSURANCE & HANDLING CHARGES. CONTINENTAL USA ONLY.
OUTSIDE CONTINENTAL USA WRITE OR CALL FOR SHIPPING CHARGES.

	California, Ariz & Nevada	Pacific & Mountain Time Zones	Eastern & Central Time Zones
800,800D 800F,800DF 8002F,800D2F 8008,700 700RV,X/5	$12.50	$16.00	$18.00
800RV,700D 700DS,700DV	$12.50	$16.00	$20.00
800DB2F,1100 800A,800AD, 800AF,800ADF 800A2F,800AD2F	$14.50	$20.00	$25.00
	MOTOR FREIGHT COLLECT-DO NOT PREPAY SHIPPING		
P[illegible],P700A	$5.00	$7.00	$9.00
P[illegible],P8[illegible],P89[illegible]	$7.00	$10.00	$14.00
[illegible]blets	$8.00	$12.00	$15.00
[illegible]	$6.00	$8.00	$10.00
[illegible]rd	$4.00	$5.00	$6.00
[illegible]0,Motherbds [illegible]es Filters	$2.50	$3.50	$4.50

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Prices are FOB Visalia, CA USA
ORDERS-Add $20 per order for document preparation. Foreign
[illegible]nts except for PC boards, accessories are shipped air freight
collect
DELIVERY-Allow 4 weeks after receipt of order for shipment of MAIN/FRAMES
DISK/COVERS. Drives, PC boards, connectors, desks are STOCK.

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Visalia Ca 93291

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Application Note

APPLICATION NOTE #3---SON OF BUILDING CHEAP COMPUTERS

CHEAP, CHEAP, CHEAP
What is a "CHEAP" computer? How cheap is cheap? For that matter, what IS a computer? Consider an appliance manufacturer. He may feel a $25 computer as a controller in his product is EXPENSIVE while at the same time he thinks his $2,000,000 business computer is CHEAP. Obviously, in each instance those are substantially different types of computer. The word cheap is relative- so is the word computer. Depending on required capability, the invested dollars can cover a wide range.

CHECK THAT ARCHITECTURE!
It turns out that the basic microcomputer is pretty cheap. Not only that, the basic PARTS are the same whether it's a $400 or $4000 machine. Open a $700 computer and you will see the same Z80's and memory chips as are in a more expensive unit. The big difference is how those parts are arranged. That is called SYSTEM ARCHITECTURE. In the construction of a house-what the architect has done makes a big effect on how pleasant it is to live there. A badly designed house can make life less than idyllic. The same goes for the architecture of a computer. Another consideration is how many people agree with you that your chosen architecture is a good one. Unlike any other small computer system, the S100 bus has a powerful supporter- the Institute of Electrical and Electronic Engineers. The industry standard S100 bus (IEEE 696) assures continued support by present manufacturers and users and increased acceptance by others who have never yet used an S100 system. Building on the S100 bus removes the curse of possibly "buying a dead horse".

THE CUTTING EDGE OF TECHNOLOGY-A TWO EDGED SWORD
Some folks insist on riding the cutting edge of technology. This attitude often leads to the feeling that your "sliding down the razor blade of life", to quote Tom Leher. Micros, in general, are state-of-the-art, but if you aren't ready for technology to take a whack at you it is best to stay slightly behind the cutting edge. Better to have a system which is a solid and FIELD PROVEN than a box of the latest ADVERTIZING PROVEN snakes.

DON'T THROW IT OUT HENRY, UPGRADE.
A good solid S100 computer that is 3 years old is still as valid a computer as one built today. BUT unlike most micros sold the S100 computer of a couple years ago can be updated with the latest hardware. You don't have to throw it out when you want to upgrade. The same goes for a S100 computer built today, it will be updateable in the future. What would be a typical update of a 3 year old S100 computer? The single density disk controller can be replaced with a double density board. The result is twice the disk capacity for about a $500 investment in hardware and software. All software generated with the old system will is transporatable to the new system, so all your old application programs won't have to be rewritten. A system assembled today out of S100 "behind the cutting edge" hardware can be upgraded in the future to larger memory, hard disk, multi-user. If you choose the right hardware today!

RIDE THE BUS
There are many good reasons to go with a bus oriented system. A bus oriented system allows great variety in system design--you aren't stuck with one manufacturers idea of how to solve your problem. A bus oriented system allows each part of the system to have more than one source of supply--something which can't be overemphasized. A bus oriented system allows future enhancements with a minimum of hassle.

LET THE PUNISHMENT FIT THE CRIME
As was mentioned above, the basic computer is pretty cheap, but when you start adding peripherals the price starts its exponential climb. The right peripherials enhance basic computer operation-make it interface with HUMANS more easily. Poorly designed or improperly chosen peripherals seriously degrade system performance. It is the peripherials which make the SYSTEM fit the required APPLICATION.

WHAT DOES IT ALL MEAN?
It boils down to this: a low cost (<$1000) computer can be built from S100 bus modules or bought as a one piece computer. When you try to make either one do what most people consider to be a REAL computing job, the bus structured approach begins to have significant benifits over the "glorified personal computer".

SO HERE WE ARE

In this note we will consider an S100 bus single user small business oriented computer. The uses for such a machine would be-word processing, name and address file handling, accounting, invoice preparation, program development, etc. The basic configuration, though, is fairly universal. Add more I/O it can be used as a data collector or instrument controller. With a modem it could be a super smart remote terminal. There are lotsa uses for a configuration of this type. At the present state of things most computers of this type are floppy disk based. The machine described can be expanded to support a hard disk and multi-user operation in the future; although we will not discuss these enhancements. What, exactly, does such a system consist of? I think the minimum system is 64K, dual 8" floppy disk based.

THE FLOPPIES HAVE IT

Without some mass storage system a computer is little more than a toy or a process controller-a general purpose machine it is not. Floppy disk drives provide low cost interchangable media mass storage with fast access time and random access to files. Why 8" floppies? 8" floppies offer a better price performance ratio than 5" drives. A single sided 8" floppy has 500K formatted capacity (double density) and costs $450 (.9 $/KB) KB-kilobyte. A double sided 8" drive, it has 1 meg formatted capacity and costs $600 (.6 $/KB). A double sided 5" double density floppy has a formatted capacity of about 350K and costs $375 (1.1 $/KB). Remember now, that's FORMATTED capacity. Many people (and ads) talk about unformatted capacity which is larger, but isn't the amount of usable storage. 8" drives are generally better built than their 5" counterparts with huskier parts, and more sure fire head drive mechanisms. This may be a personal predijuce because I like stuff that is built like a locomotive. On the basis of cost, long term reliable operation and considerable personal experience (not to mention bias) I feel the 8 incher is a better choice.

MEMORY MENU

Why a 64K memory? Why not 32k or 48K? The overhead of SYSTEM programs (CP/M and CBASIC for instance) is such that they leave little APPLICATIONS programming space in a 32K system. BETWEEN CP/M and the CBASIC run module they leave you about 10K in a 32K system. So, 32K is too small to do much without being very clever with your programming. 48K is better but, the price of memory is now pretty cheap-about $10/KB. For less than $150 extra you can usually step up from 48K to 64K which allows more programming room. We are talking about DYNAMIC RAM at these prices. I have been an advocate of static RAM for some time. Many early dynamic RAMs were pretty flakey. Within the past year I have been using dynamic RAMS that work as well as their static counterparts and the dynamic RAM is half the cost. Dynamic RAM is now ON the menu!

CPU,I SEE YOU

In the "good old days" there was a card for almost every chip!. Does anybody remember 4K memory boards? We had 16 boards for a 64K system with 32 memory chips each. We always had a separate I/O board-even though we only used one port. The architects have been doing their homework. There is a trend today toward putting more stuff on a single pc card. CPU cards with I/O ports on them are common. There is at least one CPU/64K memory combination around. There are a mind boggling number of different CPU's and CPU/whatever combinations. So, which CPU? To stay with our "behind the cutting edge" philosophy, the 8 bit processor is the logical choice. I would like to see a lot more software before jumping onto the 16 bit bandwagon-remember that razor blade! The performance of an 8 bit processor is plenty adaquate for the type of machine we are talking about here. There are two 8 bit processors heavily supported on the S100 bus, the 8080 and the Z80. Generally, I like the Z80. Probably for all the wrong reasons! The Z80 runs 8080 machine code. The 4MHz Z80 is implemented in a number of boards. It doesn't cost more than the 8080, so why not have a faster CPU-it will gloss over some wobbly software!! The Z80 support chip set is nice. I think that's why I really like the Z80.

VIDEO TERMINALS

As discussed above, a good terminal is a serious requirement. A keyboard with a nice feel, a screen big enough to see, a well formed character font, cursor addressing, background/foreground intensity, reverse or normal video. These are the HUMAN INTERFACES to the computer. If the computer is supposed to be a tool you have to be able to USE THE TOOL without going nuts!! A well designed commercial terminal makes a lot of sense. Most commercial terminals were designed for use with minis or BIG computer installations and have the features required by these installations. An 80

character by 24 line display is necessary for forms formatting and word processing. A terminal with a 7x9 character formation matrix has greatly enhanced readability over a 5x7 matrix. Addressable cursor, bright-dim fields, or reverse video are necessary to run most reasonable software. A numeric keypad aids the input of numeric data. Terminals talk RS232. Small computers invariably use the RS232 interface too. This is a clean combination because there is no hardware interface to a video board to be figured out and the attendant software drivers to implement. The terminal will run with most commercial software directly.

PRINTERS

Printers come in a variety of sizes, shapes, type faces, speeds, and print quality. Print quality and speed are for practical consideration mutually exclusive. High speed printers are of the "dot matrix" variety. The print quality is not terrific because each letter is formed from a bunch of individual dots. The small wires used to form the dots can be moved at high speed thus enabling print rates of 150 char/sec. The high print quality printers use a "daisy wheel or "thimble". A character is formed by hitting a ribbon with a hammer the shape of the desired letter. A mechanism of this type produces letters which are complete rather than being parts of a dot matrix. The large mass of the hammers slows the printing speed to the 30-50 char/sec area. Dot matrix printers are priced at two-thrds of an equivalent daisy wheel Daisy wheel printers have replaceable type fonts while some dot matrix printers have expanded or condensed fonts variable under sofware control. Small dot matrix printers are available for less than $1000-there is no comparable daisy wheel.

MAKES YER PIK AND TAKES YER CHANCES

Are your eyes beginning to glaze over? Are you wondering how to pick among fifty zillion possible parts and how they are put together without spending hundreds of hours and reading instruction manuals. AND NOT SPENDING TOO MUCH MONEY IN THE PROCESS. I can sympathize. Many hours I have spent slaving over hot instruction manuals trying to figure out why little "hidden gotchas" had to come visit me! Take heart, we didn't drag you all the way through this application note to leave you hanging!! WE HAVE THE ANSWER.

THIS IS IT!!!!!

The MOST PRACTICAL way to save siginificant money and be sure of sucessful completion in a short time is to build from assembled and tested components. ESPECIALLY if someone has picked out the components, psychoanalysed them, knows they WORK and has smoothed out the kinks. The job of sorting through tons of possible components has been done by US. We think we have selected a group of components which are hard to beat on the basis of price or performance.

We have been using the following system for over a year. It is a very reliable open ended system. The reliability comes in no small measure from using a minimum number of parts. It is possible to assemble one of these things in less than a couple hours (20 minutes when you get good at it) and have it running with a very high level of confidence that everything is gonna work RIGHT. SINCE WE USE THIS SYSTEM AND KNOW IT PRETTY WELL IF YOU SHOULD HAVE A PROBLEM WE CAN OFFER MEANINGFUL ASSISTANCE.

To make sure everything works right, we supply ALL the necessary PARTS already assembled and tested along with all the interconnecting cables and the operating system software. WE CONFIGURE THE PC CARDS TO RUN TOGETHER, AND THE SOFTWARE TO DO ITS THING SO YOU DON'T HAVE TO. We even supply instructions on how to put all the parts together and get the software up. How about that for nice guys? Not only that, we are making you a computer that is the CHEAPEST thing on the market for an equivalent performance.

The first thing we need is a good MAIN/FRAME. In case it had somehow escaped your attention we think Integrand MAIN/FRAMES are the best. Biased you say?? Absolutely, no doubt about it--but it is true. Would we lie to you? ACCEPT NO EXPENSIVE IMMITATIONS!!!! The most cost effective package for our computer is an 8" floppy MAIN/FRAME; Integrand Model 1000, 1100 or 800DB2F. These MAIN/FRAMES cost less than two boxes, one for the computer and one for the disk drives. They also make a neater package. To choose between them depends on the application and budget. We will use the 1100 in this example. See the catalog data sheets for further descriptions.

After trying a number of board sets we have found two boards which fit together like hand and glove. We presently sell ONLY these two cards. We see no reason to carry 50 different boards. There is no way we could be intimate with all of them or their possible interactions. We do not make either of these cards, so our choice has been pretty impartial. The TELETEK FDC1 is a "do almost everything" board. It is the CPU, I/O, and disk controller for the system. The Z80A chip set is used running at 4MHz. Two RS232 serial ports and one parallel port are implemented. A single/double density disk controller based on the NEC765 is on the board. FDC1 will also program 2716 ROMS and has a real time clock. A 2K ROM monitor is provided and a 1K onboard scratch pad memory. The Measurement Systems and Controls DM6400 64K dymanic RAM board is a fine compliment to the FDC1. This is a REALLY SOLID MEMORY BOARD. It just sits there and does its thing.

The 2 card computer set we chose to carry provides the complete bus oriented cards required for a single user system. THE CARDS COME CONFIGURED TO RUN WITH ONE ANOTHER. The FDC1 comes with a 2 drive cable and one serial I/O (SIO) cable as well as CP/M on diskette which is already configured for the DM6400 memory and FDC1. The memory board comes jumpered for use with the FDC1. This means you plug in the cards and plug the drives according to instructions supplied, mount the drives, plug in drives , plug in I/O cable and you have a computer ready to talk to your terminal. Not necessary to plow through hundreds of pages of manuals to find how to configure the system so it will just say "hello".

We carry the Shugart line of floppy disk drives. These guys have been at it since floppy time began. They are far and away the largest independent supplier of floppy drives. Their products work and work and work---. For this system we will use the Shugart SA801R single sided drive. Two of these drives gives 1 megabyte formatted (CP/M) capacity in double density.

What is the cost of this system?

==BASIC SYSTEM==	
Integrand 1100 MAIN/FRAME	$ 525
2ea Shugart SA801R disk drives	$ 900
FDC1 CPU,I/O, disk controller incl CP/M	$ 895
DM6400 64K memory board.	$ 650
TOTAL	$2970 **

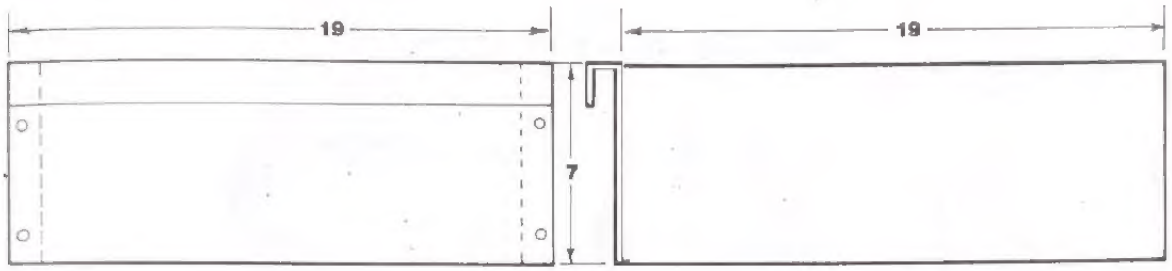
==BASIC SYSTEM AND VIDEO TERMINAL==	
Basic system from above	$2970
SOROC IQ-120 video terminal	$ 720
TOTAL	$3690 **

==WORKSTATION SYSTEM AND VIDEO TERMINAL==	
Integrand 1000 Desk+MAINFRAME	$ 900
2ea Shugart SA801R disk drives	$ 900
FDC1 CPU,I/O, disk controller inclCP/m	$ 895
DM6400 64K memory board	$ 650
SOROC IQ-120 video terminal	$ 720
TOTAL	$4065 **

That folks is a CHEAP full function computer. Add a printer mechanism TI810 dot matrix ($1900) or Diablo daisy wheel printer($2500) the price is $5570 to $6170 for a COMPLETE system. The entire system is made from industrial quality parts all of which have a PROVEN FIELD TRACK RECORD. If you compare the cost of this system to the prices advertised in the magazines you will find it comparable to systems costing up to $3000 more.

We hope this note has been helpful to you. What we have described is not a flakey deal, but a computer which can be reliably assembled by the OEM who has little in house electronic help. The ease with which it can be assembled makes it a desirable alternative to purchasing fully assembled systems. The relative simplicity of the system allows easy troubleshooting and a minimum of spare parts to stock.

INTEGRAND CABINET DIMENSIONS



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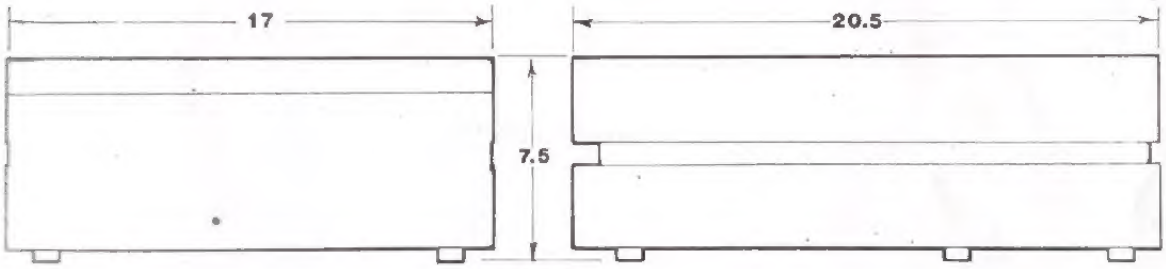
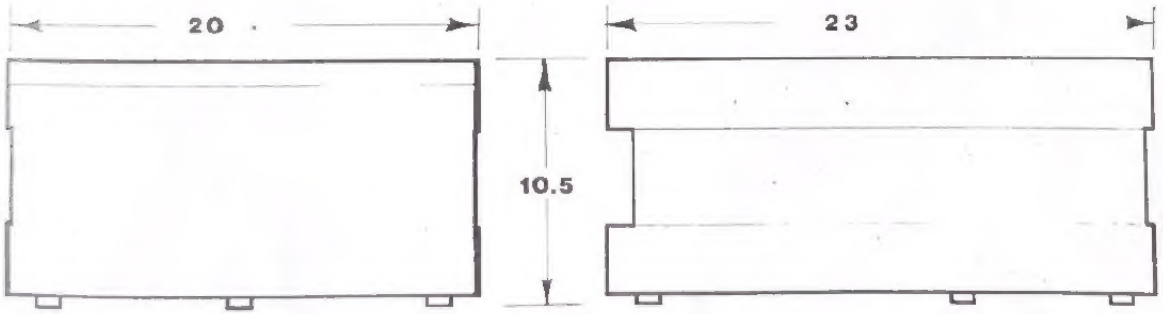
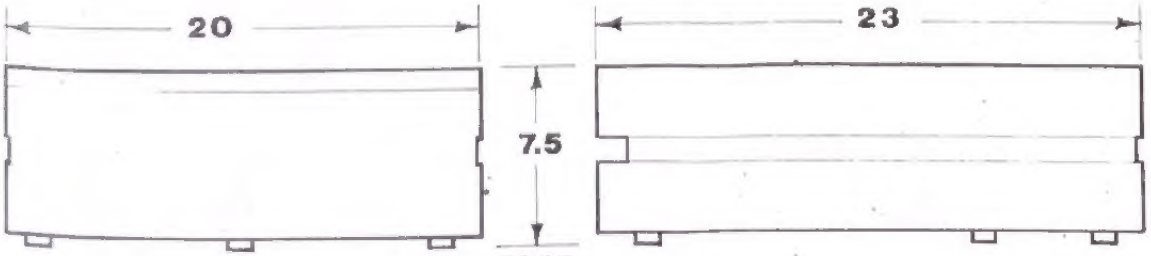


800**D**



800**DB**



700**D**

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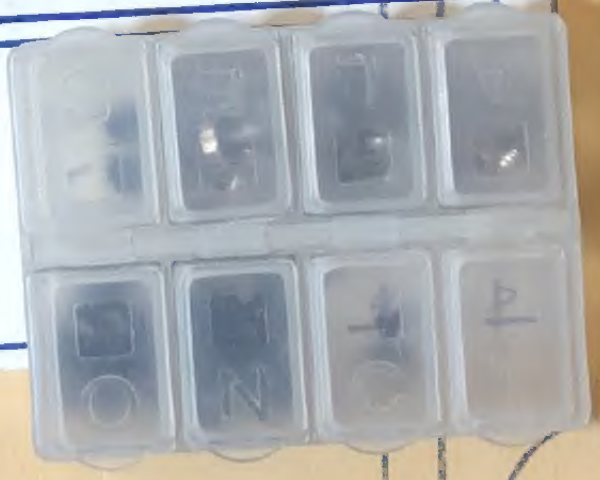

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